# FINAL PROGRESS REPORT

# FOR

# NASA CONTRACT NUMBER NNG04EE85P

## Extending the LWS Data Environment: Distributed Data Processing and Analysis

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## Summary

The final stages of this work saw changes to the original framework, as well as the completion and integration of several data processing services. Initially, it was thought that a peer-to-peer architecture was necessary to make this work possible. The peer-to-peer architecture provided many benefits including the dynamic discovery of new services that would be continually added. A prototype example was built and while it showed promise, a major disadvantage was seen in that it was not easily integrated into the existing data environment. While the peer-to-peer system worked well for finding and accessing distributed data processing services, it was found that its use was limited by the difficulty in calling it from existing tools and services.

After collaborations with members of the data community, it was determined that our data processing system was of high value and that a new interface should be pursued in order for the community to take full advantage of it. As such, the framework was modified from a peer-to-peer architecture to a more traditional web service approach. Following this change multiple data processing services were added. These services include such things as coordinate transformations and sub setting of data.

Dr. Adam Szabo, a collaborator on this work and head of the Virtual Heliospheric Observatory (VHO), assisted with integrating the new architecture into the VHO. This allows anyone using the VHO to search for data, to then pass that data through our processing services prior to downloading it. As a second attempt at demonstrating the new system, a collaboration was established with the Collaborative Sun Earth Connector (CoSEC) group at Lockheed Martin. This group is working on a graphical user interface to the Virtual Observatories and data processing software. The intent is to provide a high-level easy-to-use graphical interface that will allow access to the existing Virtual Observatories and data processing services from one convenient application. Working with the CoSEC group we provided access to our data processing tools from within their software. This now allows the CoSEC community to take advantage of our services and also demonstrates another means of accessing our system.

## Analysis

Although the peer-to-peer software did not pan out valuable, lessons were learned from this initial experience. This work was one of the first to test the usefulness of a peer-to-peer system and how that system might fit into the existing data environment. From this work came more knowledge of peer-to-peer applications and their benefits and disadvantages. Additionally, this work provided us with specific technical reasons why a peer-to-peer system may not be the best choice despite its many apparent benefits.

We were able to answer one of the fundamental questions posed at the start of this work. Namely, how would the community access and use such a distributed data processing system. By moving to a standard that was more easily adopted by existing community applications, we have created a system that is easily integrated and also expandable. Moreover, we have provided two specific examples by showing how the system can be called from an existing Virtual Observatory and also from a third party group such as CoSEC.